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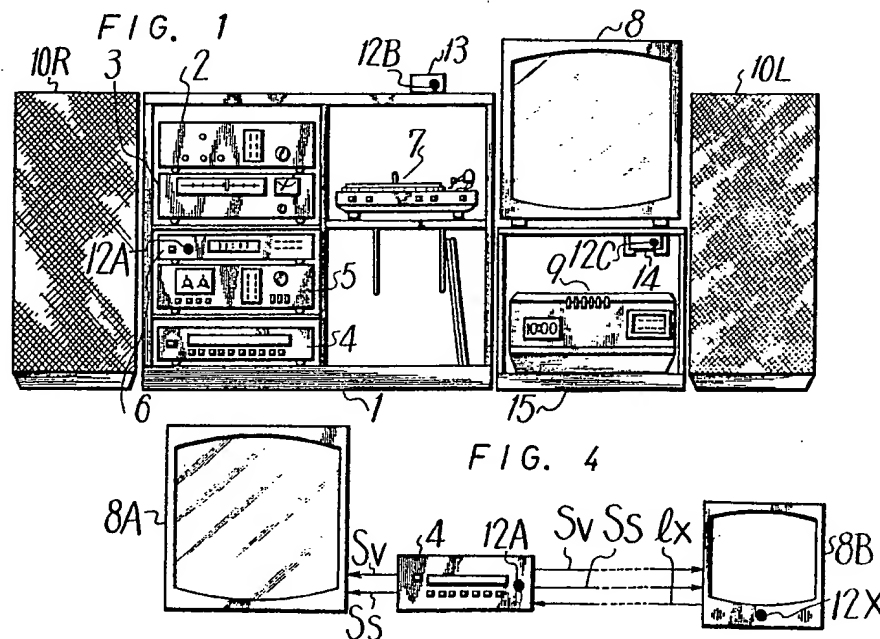
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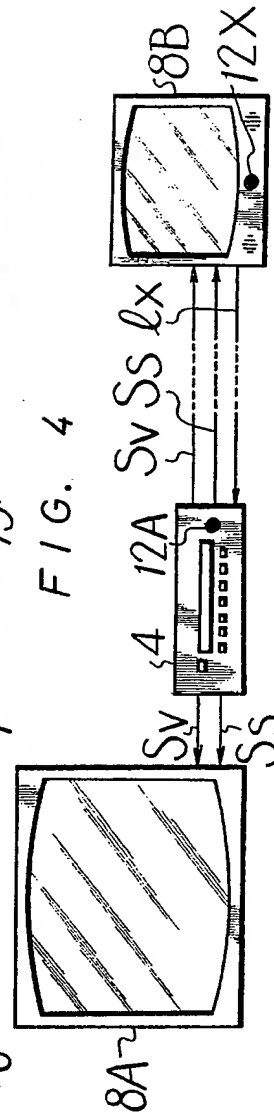
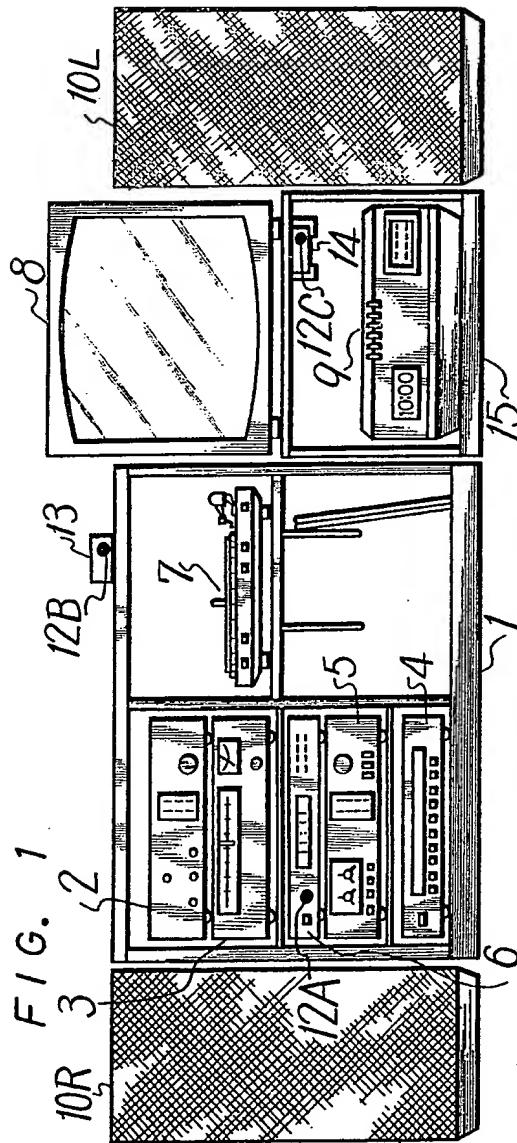
(54) Remote control arrangements

(57) A remote control arrangement is capable of selectively controlling a desired one of a plurality of devices, such as an audio tuner 3, a tape recorder 5 and a television receiver 8, in response to the transmission of remote control signals from a transmitter. A central control 6 includes a decoder 24 for decoding a remote control signal so as to produce a corresponding device control signal, this device control signal being coupled to the devices 3, 5, 8, etc. so as to control a desired one thereof in accordance with the decoded signal. The central control 6 includes at least one

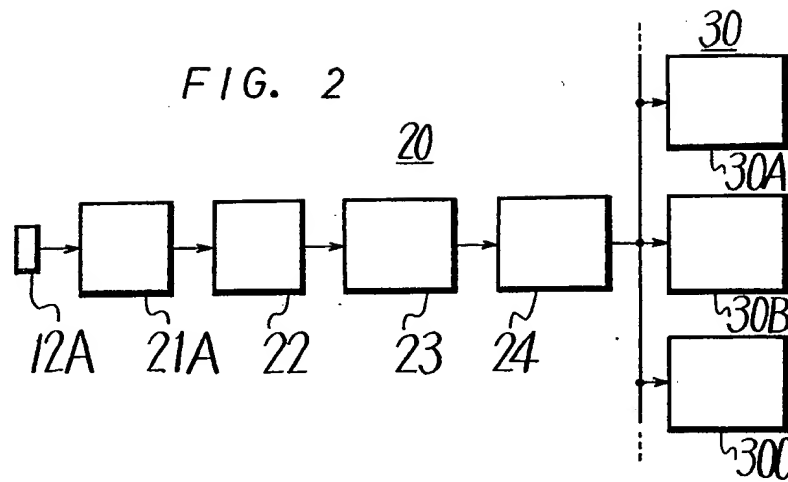
input terminal 25, 26. A plurality of receiving elements 12B, 12C, spatially separated from each other, are coupled to respective ones of the input terminals 25, 26, and a receiving element 12A is provided directly at the central control 6. The receiving elements 12A, 12B, 12C are capable of receiving a remote control signal transmitted, for example, by infra-red transmission, from the transmitter. An OR-gate 60 in the central control 6 is coupled to the respective input terminals 25, 26 and also to the receiving element 12A, so as to supply a remote control signal received by any of the receiving elements 12A, 12B, 12C to the decoder 24. Hence, a desired device 3, 5, 8, etc. is controlled regardless of the particular receiving element 12A, 12B, 12C to which the remote control signal is transmitted.



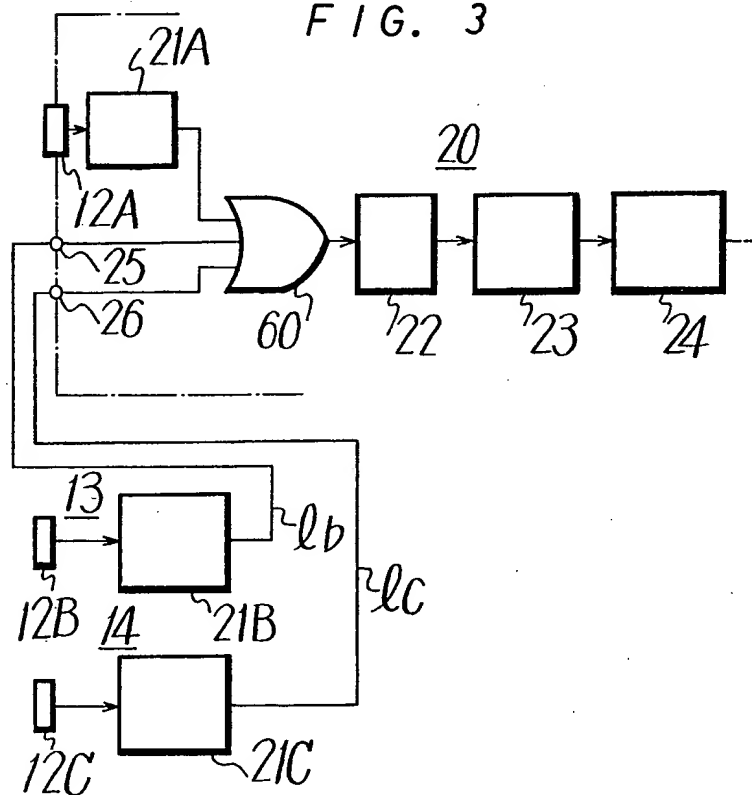
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F I G. 3



SPECIFICATION

Remote control arrangements

- 5 This invention relates to remote control arrangements.

It is now common in so-called home entertainment systems to provide control circuitry by which a user of the system can control particular devices in the system. For example, a typical home entertainment system may include a television receiver, a video tape recorder (VTR), a cassette recorder, a radio tuner, an audio amplifier and a gramophone turntable. Selective ones, or all of these devices are preferably controllable by the user from a remote location. For example, such devices may be turned ON or OFF, volume may be adjusted, a channel or broadcast station may be selected, or particular portions of a pre-recorded tape or a gramophone record may be reproduced. Such functions are achieved by transmitting a command signal from a transmitter to a central control for the devices. The command signal may be a coded signal and may modulate an ultrasonic carrier, a radio wave carrier, or the like, for transmission from the transmitter to the central control. At the central control, the modulated signal is received and decoded to produce a corresponding control signal. Hence, depending upon the particular control signal which had been encoded, a desired one of the controllable devices may be turned ON or OFF, and a particular function thereof may be selectively controlled.

Preferably, the remote transmitted control signal exhibits relatively high directivity. This is advantageous in order to avoid false triggering or actuation of the central control by spurious signals. One type of carrier which exhibits desirably high directivity is an infrared carrier. In one remote control arrangement of the aforementioned type, although a plurality of devices may be controlled, the central control is provided with only a single receiving element. While the desired device may be suitably controlled when the encoded, infrared remote control signal is transmitted to the receiving element, the user often directs his transmitter towards the particular device which he wishes to control. Hence, because of the high directivity of the remote control signal, this signal is not received by the receiving element. Consequently, the device which the user wishes to control is not controlled. Because of this, the user is often of the mistaken belief that either his command transmitter, or the central control, or the particular device which he wishes to control is not working.

This mis-direction of the transmitted remote control signal occurs frequently in an arrangement having master and remote television receivers, both of which are controlled by a common television tuner. In this arrangement,

the receiving element is usually provided directly at the common television tuner. Hence, when this master/remote television receiver arrangement is desired to be operated by the user, the remote control signal must be transmitted to the receiving element at the common television tuner. It is not unusual, however, for the user to direct the transmitted remote control signal to the master or to the remote television receiver which, of course, fails to operate in the manner which he desires.

According to the present invention there is provided a remote control arrangement for selectively controlling a desired one of a plurality of devices by the remote transmission of control signals from a transmitter, the arrangement comprising:

central control means including decoding means for decoding a remotely transmitted control signal to produce a corresponding device control signal, said central control means being coupled to said devices for controlling said desired device with said device control signal;

a plurality of receiving means spatially separated from each other, each receiving means receiving said remotely transmitted control signal;

at least one input terminal provided on said central control means, said at least one input terminal being coupled to one of said receiving means for receiving a remotely transmitted control signal therefrom; and

means for supplying the remotely transmitted control signal received at said at least one input terminal to said decoding means, whereby a desired device is controlled in response to said remotely transmitted control signal received by any one of said receiving means coupled to an input terminal.

According to the present invention there is also provided a remote control arrangement for selectively controlling a desired one of a plurality of devices by the remote transmission of control signals from a transmitter, the arrangement comprising:

central control means including decoding means for decoding a remote control signal to produce a corresponding device control signal, said central control means being coupled to said devices for applying said device control signal thereto, said central control means further including a plurality of input terminals;

a plurality of receiving means spatially separated from each other, each for receiving a remote control signal transmitted by said transmitter, one of said receiving means being disposed at said central control means and at least one other of said receiving means being positioned in the vicinity of a respective device;

connecting means for connecting said at least one other receiving means to an input terminal of said central control means to apply

a remote control signal received by said at least one other receiving means to said central control means; and

means included in said central control means and coupled to said input terminal and also to said one receiving means disposed at said central control means for supplying a remote control signal received by any of said receiving means to said decoding means; whereby a device control signal is applied to a desired said device notwithstanding the particular receiving means to which said remote control signal is transmitted.

The invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic representation of a home entertainment system to which the invention can be applied;

Figure 2 is a block diagram of a typical remote control arrangement which suffers from the disadvantages discussed above;

Figure 3 is a block diagram of an embodiment of the invention; and

Figure 4 is a diagrammatic representation of a particular use of the embodiment in a master/remote television arrangement.

Referring now to Fig. 1, the home entertainment system comprises a plurality of devices, each of which can be remotely controlled. For example, the home entertainment system may include both audio and video devices. The audio devices, which may be supported in a rack 1, may include an audio amplifier 2, including both a preamplifier and a main amplifier, an audio tuner 3, including both AM and FM tuning circuitry, a tape recorder 5, such as a so-called cassette deck, for recording audio signals and for reproducing previously recorded audio signals, and a gramophone record player 7. These devices may be interconnected in conventional manner. Furthermore, the home entertainment system also includes loudspeakers, such as left-channel and right-channel loudspeakers 10L and 10R, respectively. The loudspeakers 10L and 10R may be coupled to the output of, for example, the audio amplifier 2 so as to reproduce the audio sounds from the audio system.

The home entertainment system also includes a television receiver 8, a VTR 9 and a television tuner 4 to receive and demodulate television signals and to supply the video signals to, for example, the television receiver 8 and the audio signals to the loudspeakers 10L and 10R. These audio signals which are demodulated from the received television signal may, if desired, be supplied to the loudspeakers 10L and 10R via the audio amplifier 2.

In one arrangement of the illustrated home entertainment system, selected ones of the audio and video devices may be controlled from a remote location. In another arrange-

ment, each audio and video device may be separately and remotely controlled. In this regard, a central control 6 is provided. The central control 6 includes a receiving element 12A to receive a remotely transmitted control signal, also referred to herein as a "remote control signal". The remote control signal may be transmitted from a common transmitter, this remote control signal being encoded so as to control a desired one of the audio and video devices and, moreover, to control a desired function of that device. Thus, and for example, the same transmitter may be used to turn the television receiver 8 ON and OFF, to control the VTR 9, to control the audio tuner 3, to control the cassette deck 5, and to control the gramophone record player 7. Such central controls are known, and a compatible transmitter which is capable of transmitting a suitably encoded control signal is also known. Desirably, the remote control signal which is transmitted by the remote transmitter modulates a carrier so as to have desirably high directivity. That is, the area over which the transmitted remote control signal may be received is rather limited. For example, the remote control signal may modulated an ultrasonic carrier or an infra-red carrier. In the embodiment to be described the modulated carrier is an infra-red carrier.

When only a single receiving element 12A is provided on the central control 6, it is appreciated that, because of the high directivity of the remotely transmitted control signal, this control signal must be transmitted directly to the receiving element 12A. Thus, even although the user may wish to control the television receiver 8, he must direct his remote control signal to the receiving element 12A. This generally requires the user to aim his transmitter at the receiver element 12A. However, in many instances, if the user wishes to control the television receiver 8, for example, he may direct his transmitter directly thereto. In general, the user tends to aim his transmitter directly at the particular device which he wishes to control. With the system shown in Fig. 1, this generally has the undesired result of mis-directing the transmitted remote control signal such that it is not received at the receiving element 12A. Hence, although the remote control system may be in proper operating condition, by mis-directing the transmitter in a manner so as to point it to the particular device which he wishes to control, rather than point it at the central control 6, the user may mistakenly believe that his system is not working.

To avoid this problem, the embodiment to be described provides additional receiving elements, schematically illustrated in Fig. 1 as, for example, receiving elements 12B and 12C, juxtaposed in the vicinity of those devices which the user may wish to control. For example, the receiving element 12B is pro-

vided in a remote control receiver 13 in the vicinity of the television receiver 8, and the receiving element 12C is provided in a remote control receiver 14 in the vicinity of the VTR 9. Consequently, if the user wishes to control the television receiver 8, he need merely aim his transmitter at the remote control receiver 13. If the user wishes to control the VTR 9, he need merely aim his transmitter at the remote control receiver 14. Of course, the user may control either of these devices by aiming his transmitter at any one of receiving elements 12A, 12B or 12C.

In the system shown in Fig. 1, additional receiving elements (not shown) may be provided in the vicinity, or directly on, additional ones of the devices which the user may wish to control. Thus, the natural operation of aiming the transmitter at the particular device which the user wishes to control will effect proper control over that device.

Turning now to Fig. 2, there is illustrated a block diagram of a simple remote control arrangement of the type wherein only a single receiving element, such as the receiving element 12A, is provided. In particular, Fig. 2 illustrates the receiving section 20 of the remote control arrangement. The transmitter, which is not shown, may be of known construction. The receiving section 20 comprises a preamplifier 21A, a main amplifier 22, a receiving circuit 23 and a decoder 24. The preamplifier 21A is coupled to the receiving element 12A, the latter having been described hereinabove as being able to receive the remotely transmitted control signal. For example, if the remote control signal modulates an infra-red receiver or detector. The receiving element 12A produces an electrical remote control signal in response to the received, encoded, infra-red remote control signal.

The electrical remote control signal produced by the receiving element 12A in response to the received remote control signal is amplified by the preamplifier 21A and the amplifier 22 and is supplied to the receiving circuit 23. The receiving circuit 23 may be of known construction and supplies the remote control signal to the decoder 24.

The decoder 24 is coupled to various ones of the operating devices 30, the devices 30 being illustrated as, for example, devices 30A, 30B and 30C. Each device 30 may correspond to an audio or video device described above with reference to Fig. 1. The decoder 24 decodes the remote control signal supplied thereto so as to apply a device control signal to a selected one of the devices 30. The encoded remote control signal may include, for example, an address portion identifying the particular device 30 to which the device control signal is to be applied. The encoded remote control signal also may include a control function portion which serves to identify the particular function which is to be con-

trolled in the addressed device. The decoder 24 thus supplies, to the addressed device 30, the appropriate device control signal, which control signal may be either an analog signal or a digital signal.

Hence, in the arrangement of Fig. 2, depending on the encoded remote control signal that is transmitted to the receiving element 12A, a selected one of the devices 30A, 30B, 30C, . . . is controlled to carry out a particular function, as commanded by the user. The remote control signal may be transmitted either by a common transmitter unit which is selectively operated or programmed, in a manner so as to select a corresponding one of the devices 30 to be controlled, or, alternatively, each of the devices 30 may be associated with a respective transmitter unit, and the user may operate a particular transmitter unit to control the corresponding device 30.

A preferred form of the receiving section 20 of the remote control arrangement, in accordance with the invention, is illustrated in Fig. 3. As before, the receiving section includes the receiving element 12A, the preamplifier 21A, the main amplifier 22, the receiving circuit 23 and the decoder 24. It is assumed that these elements are provided at a central control, such as the aforementioned central control 6. The central control 6 may be separate and apart from each of the devices 30 to be controlled thereby. The central control 6 is schematically illustrated in Fig. 3 by the broken lines.

In this preferred embodiment, the receiving section 20 also includes the receiver units 13 and 14, shown in Fig. 1, the receiver units 13 and 14 being provided with the additional receiving elements 12B and 12C, respectively. As mentioned previously, the receiver units 13 and 14 are positioned remotely from the central control 6. Thus, the receiving elements 12A, 12B and 12C are seen to be spatially separated from each other.

The receiver unit 13 also includes a preamplifier 21B which is coupled to the receiving element 12B. Likewise, the receiver unit 14 includes a preamplifier 21C which is coupled to the receiving element 12C. The arrangement between each receiving element and its associated preamplifier is similar to the interconnection between the receiving element 12A and the preamplifier 21A, described above with respect to Fig. 2.

The preamplifier 21B is coupled via a conductive lead I_b to an input terminal 25 on the central control 6. Similarly, the preamplifier 21C is coupled by a conductive lead I_c to an input terminal 26 which is also disposed on the central control 6. Although not shown herein, the central control 6 may be provided with additional input terminals, each of which is coupled by a conductive lead to a respective remotely disposed receiver unit.

The input terminals 25 and 26 may be

formed as conventional jacks, and each of the conductive leads I_b and I_c may terminate in a connector plug to be removably inserted into a respective jack. Thus, if desired, other remote receiver units may be selectively connected to the input terminal 25 or the input terminal 26 in place of the remote receiver units 13 and 14, respectively. Stated in general terms, the central control 6 may be provided with n input terminals, and the remote control arrangement may be provided with m remote receiver units, wherein n and m are integers which may or may not be equal to each other.

The preamplifier 21A, which is preferably included in the central control 6, as well as the input terminals 25 and 26 of the central control 6, are all coupled to respective inputs of an OR-gate 60. If the remote control signal produced at the output of each of the preamplifiers 21A, 21B and 21C is a digital-type signal, the OR-gate 60 may comprise a conventional logical OR-gate. Alternatively, if the remote control signals produced at the output of the preamplifiers 21A, 21B and 21C are analog signals, the OR-gate 60 may comprise a conventional analog OR-gate. Thus, the OR-gate 60 functions to transmit, or gate, the remote control signal received at any one of the receiving elements 12A, 12B and 12C and amplified by an associated one of the preamplifiers 21A, 21B and 21C to the main amplifier 22.

From the embodiment shown in Fig. 3, it is appreciated that the decoder 24 is supplied with the remote control signal that is received at any one of the receiving elements 12A, 12B and 12C. Thus, regardless of the particular receiving element 12A, 12B or 12C to which the remote control signal is transmitted, the desired device which is to be controlled, as determined by the content of the remote control signal, will be supplied with the device control signal by the decoder 24. For example, and with reference to the arrangement shown in Fig. 1, if the television receiver 8 is to be controlled, the user may aim his transmitter at the receiver unit 13 so as to transmit an appropriate remote control signal to the receiver unit 13. Alternatively, the very same remote control signal may be transmitted to the receiving element 12A, included in the receiver unit 14. Regardless of the particular receiving element 12A, 12B or 12C which receives the remote control signal, the OR-gate 60 supplies this remote control signal to the decoder 24. Consequently, depending upon the content of the remote control signal, this signal is decoded by the decoder 24 and supplied to the desired one of the devices 30.

As an alternative, the preamplifiers 21B and 21C may be included in the central control 6. However, since the remote control signal produced by the receiving elements 12B and 12C is relatively weak, this weak remote con-

trol signal may be subjected to undesired interference as it is transmitted to the preamplifiers via the conductive leads I_b and I_c .

Although the receiver units 13 and 14 and, particularly, the receiving elements 12B and 12C, are preferably juxtaposed in the vicinity of the particular devices 30 which are to be controlled, the receiver units 13 and 14 may be positioned at any desired location, and may be remote from the particular device 30 which is to be controlled. Advantageously, since a particular receiving element 12A, 12B or 12C is arranged to receive the remote control signal which is intended to control any of the plurality of the devices 30, rather than being dedicated to a single device 30, the receiving elements 12A, 12B and 12C may be positioned at any desired locations.

Although the central control 6 is illustrated as being separate and apart from the various devices 30 to be controlled, it should be appreciated that, if desired, the central control 6 may be integrated with, or provided in, any one of such remotely controllable devices 30.

Referring now to Fig. 4, there is illustrated a particular arrangement in which the embodiment may be used. This arrangement is referred to as a master/remote television arrangement and, as illustrated, includes a master television receiver 8A, a remote television receiver 8B and a common television tuner 4. The master television receiver 8A may include only the video components of a conventional television receiver; the audio components thereof may be replaced by, for example, an audio amplifier and audio loudspeakers, such as the amplifier 2 and the loudspeakers 10L and 10R, shown in Fig. 1. Alternatively, the master television receiver 8A may include the usual audio components of a conventional television receiver.

The remote television receiver 8B, also referred to as a monitor television receiver, preferably includes a loudspeaker therein.

Both the television receivers 8A and 8B are coupled to the television tuner 4 and receive video and audio signals S_v and S_s , respectively, from the television tuner 4. The television tuner 4 may be tuned to any desired television channel, and the video and audio programme information received on that television channel is supplied to both the master television receiver 8A and the remote television receiver 8B.

Desirably, the master/remote television arrangement of Fig. 4 is remotely controllable. To this end, the television tuner 4 is provided with the receiving element 12A, which may be of the type described above and shown in Figs. 2 and 3, and the remote television receiver 8B is provided with a receiving element 12X. The receiving element 12X may be of the type shown in Fig. 3, such as the receiving elements 12B and 12C. The receiving element 12X may be connected to a

preamplifier (not shown) which, in turn, is coupled via a conductive lead I_x to the central control which is included in the television tuner 4. This central control may be of the type shown in Fig. 3, wherein the conductive lead I_x may be used in addition to, or in place of, the conductive leads I_b and I_c . Thus, when a remote control signal is transmitted either to the receiving element 12A or to the receiving element 12X, this remote control signal is supplied to the decoder 24, in the manner discussed above with respect to Fig. 3. Consequently, the television tuner 4 may be appropriately controlled to be turned ON or OFF, to select a desired channel or to adjust the audio volume. Furthermore, one or the other, or both, of the master television receiver 8A and the remote television receiver 8B may be selected, or switched, in accordance with the remotely transmitted control signal. Thus, a viewer who is positioned remotely may transmit an appropriate remote control signal to the receiving element 12A or to the receiving element 12X, whereby the master television receiver 8A is turned ON, or the remote television receiver 8B is turned ON, and the particular television receiver which is energized then may be suitably controlled from the user's remote location. For example, if the television tuner 4 is positioned near, or provided in the master television receiver 8A, the operation of the remote television receiver 8B nevertheless can be controlled by the user merely by transmitting the appropriate remote control signals to the receiving element 12X.

It will be appreciated that the master/remote television arrangement of Fig. 4 may be replaced by a similar master/remote audio arrangement of the type wherein audio loudspeakers are disposed at different locations, and the "master" loudspeakers as well as the "remote" loudspeakers may be selectively enabled or disabled from a remote location merely by transmitting the appropriate remote control signal to one or the other of the spatially separated receiving elements.

While the invention has been particularly shown and described with reference to preferred embodiments, it will be appreciated that various changes and modifications can be made. For example, the encoded remote control signal may be transmitted by modulating other suitable carriers. Furthermore, the relative directivity of the remotely transmitted control signal may be relatively high, so as to require relatively accurate transmission of the remote control signal directed to a particular receiving element, or may be relatively low so as to permit the user to aim his transmitter merely in the general direction of a receiving element. Furthermore, an additional number of input terminals and corresponding remote receiver units coupled thereto may be provided in the central control 6 as well as in the television tuner 4, depending upon the num-

ber of controllable devices 30.

CLAIMS

1. A remote control arrangement for selectively controlling a desired one of a plurality of devices by the remote transmission of control signals from a transmitter, the arrangement comprising:
 - central control means including decoding means for decoding a remotely transmitted control signal to produce a corresponding device control signal, said central control means being coupled to said devices for controlling said desired device with said device control signal;
 - a plurality of receiving means spatially separated from each other, each receiving means receiving said remotely transmitted control signal;
 - at least one input terminal provided on said central control means, said at least one input terminal being coupled to one of said receiving means for receiving a remotely transmitted control signal therefrom; and
 - means for supplying the remotely transmitted control signal received at said at least one input terminal to said decoding means, whereby a desired device is controlled in response to said remotely transmitted control signal received by any one of said receiving means coupled to an input terminal.
2. An arrangement according to claim 1 wherein one of said receiving means is provided at said central control means.
3. An arrangement according to claim 2 further comprising a respective amplifier means coupled to each of said receiving means for amplifying the remotely transmitted control signal received thereby.
4. An arrangement according to claim 3 wherein the amplifier means coupled to the receiving means provided at said central control means is coupled to said means for supplying, and said amplifier means coupled to the remaining receiving means is coupled to said at least one input terminal.
5. An arrangement according to claim 1 wherein selected ones of said receiving means are juxtaposed in the vicinity of said devices for receiving a remotely transmitted control signal directed to a respective one of said devices.
6. An arrangement according to claim 1 wherein said central control means is separate and apart from said selectively controlled devices.
7. An arrangement according to claim 1 wherein said means for supplying the remotely transmitted control signal to said decoding means comprises an OR-circuit having inputs coupled to at least said input terminals.
8. An arrangement according to claim 1 wherein said remotely transmitted control signal is a modulated infra-red signal, and each receiving means includes an infra-red detec-

tor.

9. An arrangement according to claim 1 wherein said transmitter is a common transmitter actuable to generate different control signals for controlling each of said devices.

10. An arrangement according to claim 1 wherein said devices include master and remote television receivers and a common television tuner coupled thereto, said central control means being disposed at said common television tuner and having a receiving means thereon, and said remote television receiver is provided with a receiving means coupled to a respective input terminal.

11. A remote control arrangement for selectively controlling a desired one of a plurality of devices by the remote transmission of control signals from a transmitter, the arrangement comprising:

- central control means including decoding means for decoding a remote control signal to produce a corresponding device control signal, said central control means being coupled to said devices for applying said device control signal thereto, said central control means further including a plurality of input terminals; a plurality of receiving means spatially separated from each other, each for receiving a remote control signal transmitted by said transmitter, one of said receiving means being disposed at said central control means and at least one other of said receiving means being positioned in the vicinity of a respective device;

- connecting means for connecting said at least one other receiving means to an input terminal of said central control means to apply a remote control signal received by said at least one other receiving means to said central control means; and

- means included in said central control means and coupled to said input terminal and also to said one receiving means disposed at said central control means for supplying a remote control signal received by any of said receiving means to said decoding means;

- whereby a device control signal is applied to a desired said device notwithstanding the particular receiving means to which said remote control signal is transmitted.

12. An arrangement according to claim 11 wherein each of said receiving means includes an amplifier for amplifying the remote control signal received thereby.

13. A remote control arrangement substantially as hereinbefore described with reference to Figs. 1 and 2 of the accompanying drawings.

14. A remote control arrangement substantially as hereinbefore described with reference to Figs. 1 to 4 of the accompanying drawings.

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